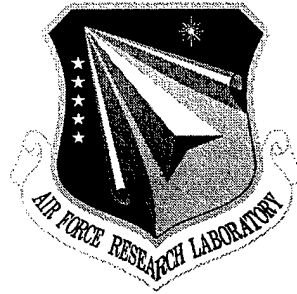


AFRL-IF-RS-TR-1999-92
Final Technical Report
May 1999



**MODULAR AVIONICS TEST EQUIPMENT
(MATE 390) TEST PROGRAM SET (TPS)
DEMONSTRATION**

Synectics Corporation

Jerry Krinsky and Cheryl Haritatos

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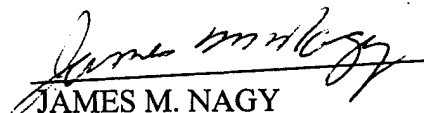
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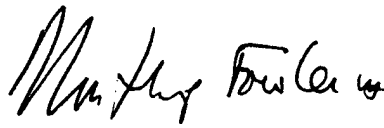
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13. ABSTRACT (Maximum 200 words) The goal of this task was to upgrade and enhance the existing 390 testers at Kelly AFB to expand system life expectancy to ensure maintainability and supportability. This was accomplished by replacing existing processors with state-of-the-art commercial off-the-shelf (COTS) Pentium processors and providing software upgrades to maintain system operational capability with the existing Test Program Sets (TPSs). The IE 390 upgraded test stations now have a common hardware configuration and use the same version of software. System training and demonstrations were provided to familiarize Air Force engineers with the operation and capability of the upgraded systems. The open architecture of the upgraded 390 hardware and software also allows easier future COTS upgrades.				
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1.0 SUMMARY

All of the goals of this project were achieved through "Technology Insertion". The existing Test Program Sets (TPSs) have all been satisfactorily demonstrated to run on the upgraded IE 390 test systems. The three Systems run better with the same revision of the operating system software installed on each of them. The obsolete hardware has been replaced and the system is now more easily maintainable, and it has been positioned to meet new workload requirements. Any future COTS upgrades will be less of a burden on the Government because of the open architecture of the test systems hardware and software. The life expectancy of these systems has been greatly increased.

2.0 INTRODUCTION

This project was originated to extend the useful life of the System 390, Model 4301, Serial numbers 260, 322, and 333. The equipment configuration was aging and a means had to be found to replace obsolete hardware and to extend the life expectancy of the Systems. The workload of the Systems needed to be continued for at least another 20 years. As the equipment aged, repair was becoming increasingly difficult. By substituting new, readily available equipment, obsolescence will no longer be a problem.

The goals of this project follow.

1. Upgrade the System 390, Model 4301, Serial Numbers 322 and 333 to operate from a Pentium PC replacing the ADDS terminal.
2. Upgrade the System 390, Model 4301, Serial Number 260 with the necessary hardware and software to make it functionally the equivalent of the other two System 390s, Model 4301, Serial Numbers 322 and 333.
3. Ensure that all existing TPSs operate on the upgraded test systems.

These changes will enable the System 390s currently at Kelly Air Force Base to continue to perform their current workload well into the next millennium. They will also be able to handle additional workload with their current configuration, or be easily upgraded for any workload that may be added in the future.

3.0 METHODS

This project was accomplished by upgrading each of the three System 390s in the following manner.

3.1 HARDWARE CHANGES

❑ S/N 322

- ◆ A Gateway Pentium 166 was added to the System as a replacement for the ADDS Terminal.

❑ S/N 333

- ◆ A Gateway Pentium 166 was added to the System as a replacement for the ADDS Terminal.

❑ S/N 260

- ◆ A Gateway Pentium 166 was added to the System as a replacement for the ADDS Terminal.
- ◆ A 32-bit Mini Computer was added to the system as a replacement for the 16-bit Mini Computer.
- ◆ An HP53132 Timer/Counter was added to the System as a replacement for the HP5326 Timer/Counter.
- ◆ A Fluke 8522 DMM was added to the System as a replacement for the Fluke 8375 DMM.
- ◆ A Wavetek 650 Function Generator was added to the System as a replacement for the Wavetek 152.
- ◆ A programmable Elgar 153 Power Source was added to the System as a replacement for the non-programmable version.
- ◆ Several System power supplies were upgraded.
- ◆ A System 400 MB SCSI disk drive was added to supplement the 5 MB disk drive.

3.2 SOFTWARE CHANGES

☐ S/N 322, 333, 260

- ◆ The Operating System Software was modified for the three Systems. All are now using the same version of the software. The system software is intelligent enough to determine which system hardware is in place and act accordingly.

3.3 TEST PROGRAM SET CHANGES

No changes were made to any of the TPSs. Each TPS that ran on any of the three Systems did not require any modifications.

4.0 RESULTS

This project saw the following results.

- ☐ All three System 390s are using the same 32-bit system software even though there are differences in the equipment configurations. When the System powers up, the software checks the addresses of the hardware to determine the serial number. The software then automatically modifies its data base to contain the correct devices and addresses of those devices. Prior to this project, there were two operating systems for the three Systems.
- ☐ All the current TPSs written for the System 390, Model 4301, can be run on any of the three Systems and obtain the same results. This was not a capability before the project.
- ☐ All three Systems have the capability to be networked together using the front-end PC that is the control device. They can obtain a selected TPS from any networked PC or System. This allows for more thorough quality control of each TPS. Prior to this project, each System was totally independent of the others and any TPS could be different among the three Systems.
- ☐ All three Systems are now at a level where they are easier to maintain. It will be easier to deal with any further equipment obsolescence. These systems can be more easily maintained and will be able to perform their current workload assignment well into the next millennium. They will also be capable of accepting new workload with the current

equipment configuration, or with the addition of a hardware upgrade. These Systems are now virtually free from obsolescence.

5.0 CONCLUSIONS

The IE System 390 is under Department of Defense (DoD) inventory control (FSN 6625-01-124-4891) and has remained a versatile and supportable test station for the military. We have demonstrated that the IE System 390 will remain a valuable part of the Air Force's inventory for as long as needed to continue the current mission within the lifetime of the equipment being supported. The IE System 390s have proven to be modular in both hardware and software and have met the concept of the Air Force's Integrated Weapons Support Management (IWSM). These stations will remain a supportable part of the Government's test equipment inventory well into the next century.

6.0 RECOMMENDATIONS

The Air Force has just completed upgrading the three IE 390 Hybrid Test Stations to a common configuration and control footprint. These systems have served as a backbone of test capability for the Air Force by supporting a large variety of circuit boards from F-16 avionics circuits to organically supported test system circuits. These test systems were specified from concept to be the tester's tester with accuracy far greater than the existing test systems. This is as true today as it was 18 years ago when the first system was purchased. This fact has led to a significant workload being implemented on these machines.

Consequently, these machines have undergone several upgrades to ensure supportability without any alteration to the existing TPSs or interruption in testing capability. Since these machines will be needed for many years into the future as the Air Force mission changes to include space dominance, it is recommended that several steps be taken.

1. A study is needed to establish a time-phased upgrade plan for the systems to ensure their supportability into the next century. This will enable intelligent support fund planning.
2. A training program is needed for the new owners at Warner Robins AFB to familiarize their personnel with the capability, programming, and operation of the systems.

3. New software technologies should be investigated as potential additions to the software environment to enhance programming and diagnostic capabilities.
4. Because of the modular flexibility of these stations, potential for the addition of new hardware capability is built in. New workloads should be analyzed in terms of expanding the capability of these stations to embrace their needs. Specific areas include Digital Pin Electronics, virtual instruments, RF instruments, and diagnostic aids. The fact that these stations are already in inventory makes it easy to acquire a new capability.

The IE 390 Test Systems have a long history of service to the Air Force. They are providing an excellent level of service to justify their need. A premier test system integrator provides support and is on the leading edge of ATE Technology. IE stands ready to accept any assignment to assist the Air Force Depot to accomplish their mission.

7.0 ACRONYMS

ATE	Automatic Test Equipment
COTS	Commercial Off-the-Shelf
IWSM	Integrated Weapons Support Management
MB	Megabyte
PC	Personal Computer
S/N	Serial Number
TPS	Test Program Set

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